

RESEARCH PAPER



An educational intervention to improve attitudes regarding HPV vaccination and comfort with counseling among US medical students

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ABSTRACT

Many medical students are not comfortable recommending the human papillomavirus (HPV) vaccine because they do not feel prepared to discuss it with their patients. A prior study demonstrated that this is particularly a problem among unvaccinated students. Our purpose was to determine if medical student attitudes and comfort with counseling could be improved by attending a single lecture delivered by an expert on the topic. To assess the effects of the educational program, we conducted pre- and posttests on medical students before and after a single lecture on HPV vaccination. Changes in items related to attitude and comfort were examined. Student characteristics associated with changes in scores were also examined and compared. A total of 256 medical students participated in the pre- and posttests. Before the lecture, students demonstrated low knowledge of HPV vaccination and did not feel comfortable counseling parents of younger patients. However, students <30 years of age demonstrated significant improvements after the lecture in comfort. Asian and Hispanic students showed the greatest improvement in comfort with counseling, as did students who reported they had not received the HPV vaccine. Attending a single lecture given by an expert can improve medical students' attitudes and comfort with HPV vaccine counseling, especially if the students were not vaccinated themselves. This study suggests that including material on HPV vaccination in the standard medical student curriculum could help increase physician recommendation for the HPV vaccine.

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Introduction

Infection with human papillomavirus (HPV) can lead to six different types of cancer, including cervical, oropharyngeal, anal, penile, vulvar, and vaginal.¹ The incidence of these cancers could be markedly reduced by timely HPV vaccination. To achieve this, the Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination of both boys and girls at 11–12 years of age. The vaccine may be given as early as age 9 and catch-up vaccination is recommended through age 26 for those not vaccinated at a younger age.^{2,3} Adults aged 27–45 years may also receive the vaccine. However, uptake and completion rates still remain suboptimal in the US even though the vaccine has been available for over a decade. Recent estimates show that only 66% of males and 70% of females 13–17 years of age in the US have initiated the HPV vaccine. Furthermore, only 49% of males and 54% of females reported completing the series with either 2 doses (if initiated before 15 years old) or 3 doses (if initiated at ≥15 years of age).⁴ This demonstrates that interventions are critically needed so that Healthy People's goal of completely vaccinating 80% of all 13–15 year olds can be achieved by 2020.⁵

One of the best ways to address low HPV vaccination rates is to improve the frequency and strength of physician recommendation, as both have been shown to be highly associated with

uptake.^{6–8} In addition to educating practicing physicians, it is important to help medical students understand the importance of counseling patients, as they are the next generation of providers. However, prior studies have shown that many medical students do not feel comfortable recommending this vaccine, particularly if they have not received it themselves.^{9,10} This may present a significant challenge to the future physicians when they encounter the growing phenomenon of vaccine hesitancy, as vaccine hesitant parents often need additional counseling.^{11–13} Education has been shown to improve medical students' knowledge¹⁰ of the HPV vaccine, but ways to improve their attitudes or confidence in recommending it to future patients have not been developed or tested. The purpose of this study was to assess the effectiveness of attending a single lecture, given by an HPV expert, on improving medical student attitudes and level of comfort with counseling patients about the HPV vaccine.

Methods

A convenience sample of medical students attending a scheduled lecture during their third year obstetrics-gynecology rotation at the authors' home institution were asked to participate. Between May 2016 and November 2018, the first author (ABB) conducted a total of 12 presentations on HPV and the HPV vaccine to medical

students at the University of Texas Medical Branch at Galveston (UTMB). The presentations covered HPV disease etiology; incidence of HPV-related cancers; HPV vaccine safety, efficacy, and recommendations for use. In addition, barriers to HPV vaccination and methods to overcome them were discussed. With Institutional Review Board (IRB) approval, a 1-page anonymous voluntary pencil and paper survey was administered immediately before and after the lecture. An introductory slide displayed as students entered the lecture room described the pretest/posttest as research and explained that participation was voluntary and choosing to decline would not affect their grade. The lecturer (first author) also stated verbally that participation in the surveys is optional. Completion of the survey was interpreted as consent. The questionnaire asked about basic demographics, as well as knowledge, attitudes, and educational needs regarding HPV vaccination. The 4 knowledge questions asked about the Centres for Disease Control and Prevention's (CDC's) recommended dosing schedules for follow-up injections for patients ≥ 15 years old, contraindications for HPV vaccination, whether HPV testing is necessary for HPV vaccination in women, and whether patients need to restart the series if more than 6 months had lapsed since they received their first dose, but had not completed the series. An additional 24 questions assessed 1) attitudes, 2) comfort with HPV vaccine counseling, and 3) how students wished to receive additional information about new vaccines. Responses to both of the identical pretests and posttests were paired using unique IDs for each pair of surveys. Participants were excluded from this study if they did not return both the pre- and post-lecture surveys. Each pretest and posttest took approximately 10 minutes to complete. Participants who returned both surveys received a small gift valued at $\leq \$5$ as compensation for their time. Survey questions had been adapted from previous questionnaires, and items were examined for face validity by university employees not participating as study subjects before administration to students.

Statistical analysis

The 4 knowledge questions were scored as either correct or incorrect. We examined the difference in the proportion of those who responded correctly to knowledge questions in the pretest as compared to the post test. Percent change in proportion of correct responses for knowledge items between pretest and posttest assessments were calculated by subtracting the proportion of pretest correct responses from the proportion of correct posttest responses, and then dividing by the proportion of correct pretest responses. Final proportions were multiplied by 100%.

The 24 questions on attitudes, comfort with counseling, and educational needs had three response categories (agree, neutral, or disagree). Each of these 24 questions was scored as follows: 1 for agree, 0 for neutral, -1 for disagree. Items were reverse scored if disagreement with the statement was an improvement in attitude. For example, disagreement with the statement, "I think that the HPV vaccine can cause serious side effects" would have been reverse scored. We counted the number of respondents who responded differently to one of

the beliefs and attitudes questions after the presentation and grouped the change as regression or improvement. We grouped participants who did not change their responses by score (agree, neutral, or disagree).

For questions related to counseling comfort, mean change and 95% confidence intervals were calculated. We used a 2-sided paired t-test to determine whether the change in mean score after a presentation was significant. A 2-sided Wilcoxon signed-rank test was used when normality assumptions for mean scale scores were not met. This sample size had 88% power to detect a mean difference of 0.2 in paired t-test calculations with a significance of $p \leq 0.05$. Mean changes that were positive indicated a change toward greater agreement with the statement or combination of statements for counseling comfort scores. Negative values indicated a change toward greater disagreement with the statement or combined set of statements for the total score calculated for counseling comfort. We examined the difference in mean group score for these questions between the pretest and posttests. If 95% confidence intervals for the mean differences for each of these questions did not include 0, the mean change between pretest and posttest scores was considered significantly different.

Finally, we combined the scores across the 15 questions on counseling comfort. Possible scores for each individual ranged from -15 to 15. The differences between the total mean pretest and posttest scores for counseling comfort were compared for each demographic category to examine whether there were differences by demographics.

All statistical analyses were conducted using SAS software 9.4® (Cary, North Carolina). Significance was assessed as $p \leq 0.05$.

Results

A total of 276 students attended one of 12 lectures on HPV and the HPV vaccine. Of these, 256 (93%) completed both the pre- and posttest. Most of the medical student participants were less than 30 years old (94.5%). Fifty-six percent were males, and 48% were white. The students were diverse with 24% Asian, 13% Hispanic, 8% black, and 6% reporting other race/ethnicity. The demographic characteristics of participants in our study was similar to that of the overall medical student body population at UTMB (Supplemental Table 1). The proportion of self-reported HPV vaccination was 44.6%.

Overall, more participants answered knowledge questions correctly after as compared to before the presentation (Table 1). The greatest increase in knowledge was among those correctly reporting the follow-up dosing schedule for patients ≥ 15 years old. The proportion of participants who answered incorrectly about restarting the three-dose series decreased 82% compared to the pretest. Over half of the medical students already knew before the lecture that sexually active women did not need to be tested for HPV before getting the vaccine, but there was still a significant increase in the proportion who responded correctly after the presentation compared to before.

We also observed significant changes in beliefs and attitudes related to the HPV vaccine (Table 2). The largest increase in agreement after the presentation occurred for the item, "I believe the HPV vaccine should be required for school attendance," with

Table 1. Association between human papillomavirus vaccine-related knowledge and time of test (N = 256).

Medical student knowledge related to HPV	Pre test	Post test	% change
What is the CDC recommended dosing schedule for follow-up injections of the HPV vaccine for patients ≥15 years old?	80	176	119.8%
Correct (2 & 6 months)	(31.3)	(68.8)	-54.6%
Incorrect	176	80	
	(68.7)	(31.2)	
Which is/are contraindication (s) for the HPV vaccine?	123	224	81.9%
Correct (High fever)	(48.1)	(87.5)	-75.9%
Incorrect	133	32	
	(51.9)	(12.5)	
Sexually active women should be tested for HPV before getting the HPV vaccine.	158	212	34.2%
Correct (False)	(61.7)	(82.8)	-55.1%
Incorrect	98	44	
	(38.3)	(17.2)	
If a patient received the 1st dose of the HPV vaccine > 6 months ago, the CDC recommends that she/he start the series over and get 3 more doses.	141	235	66.6%
Correct (False)	(55.1)	(91.8)	-81.7%
Incorrect	115	21 (8.2)	
	(44.9)		

Table 2. Frequency and percentage of beliefs and attitudes changes about the human papillomavirus (HPV) vaccine after lecture (N = 256).

Beliefs and Attitudes	# of people who regressed their attitude (%)	# of people with same attitude (%)			# of people who improved their attitude (%)
		Disagree	Neutral	Agree	
I believe that the HPV vaccine provides more benefit than harm. (A)	8 (3.2)	2 (0.8)	0	224 (88.9)	18 (7.1)
The HPV vaccine should not be offered to patients until they are sexually active. (D)	17 (6.8)	6 (2.4)	2 (0.8)	184 (73.0)	43 (17.0)
I think that the HPV vaccine can cause serious side effects. (D)	15 (6.1)	4 (1.6)	9 (3.6)	161 (65.2)	58 (23.5)
The HPV vaccine saves lives. (A)	6 (2.4)	0	4 (1.6)	218 (86.2)	23 (9.8)
I expect to see benefits from HPV vaccination in my patient population. (A)	6 (2.4)	0	6 (2.4)	217 (86.1)	22 (9.1)
HPV is an important public health threat. (A)	6 (2.4)	0	2 (0.8)	231 (92.0)	14 (4.8)
I believe the HPV vaccine should be required for school attendance. (A)	15 (5.9)	31 (12.2)	46 (18.1)	83 (32.7)	79 (31.1)

Parentetical "A" or "D" following each Belief and Attitudes statement indicate whether "Agree" or "Disagree," respectively, was the target response. Bolded values indicate improvement >15%.

nearly one-third of respondents changing from disagreeing to agreeing with the statement. Additionally, nearly a quarter of respondents changed their belief that the vaccine may cause serious side effects after the presentation. Finally, over 15% of people disagreed with the belief that the HPV vaccine should not be offered to patients before they become sexually active after the lecture, when they had agreed before it.

Comfort with HPV vaccine counseling increased significantly for all items after the lecture (Table 3). Mean increases were strongest for items related to counseling males about the HPV vaccine. Pretest responses were highest for willingness to discuss HPV vaccination with parents when adolescents presented for other problems. The scores for this item increased further after the presentation. Medical students agreed they needed more information about the HPV vaccine on the pretest. After the lecture, there were significant declines in reports of needing more information. In particular, students felt after the lecture that they did not need as much information about the HPV vaccine or its safety profile. Finally, after the presentation, students indicated that they felt significantly more comfortable educating vaccine hesitant patients about the HPV vaccine, and that they felt more comfortable offering the vaccine to all age groups included in the ACIP guidelines for HPV vaccination. No significant change in comfort

level of recommending a vaccine against a sexually transmitted infection was found.

No change in preference for using peer-reviewed journals to learn about new vaccines was observed after the presentation (mean change -0.05, 95% confidence interval (CI) -0.16, 0.05). However, there was a small, but significant, increase in the preference for learning about new vaccines from lectures by experts (mean change 0.12, 95% CI 0.02, 0.22). There was a small, but significant, decrease (mean change 0.11, 95% CI -0.22, -0.002) in the preference for using online materials to learn about new vaccines after the presentation compared to before.

Overall, total comfort with counseling increased significantly among medical students by a mean of 1.43 points after as compared to before the presentation (Table 4). Positive changes were noted among students <30 years old, but changes were not significant among those ≥30 years of age. Both males and females had an increase in their comfort with counseling. Much of the increase observed in comfort occurred among Asian and Hispanic students while white, black, and those reporting other race/ethnicity did not demonstrate significant increases. A significant increase in counseling comfort occurred among students who had not received the HPV vaccine but there were no significant increases among students who reported initiating the vaccine series.

Table 3. Change in comfort with HPV vaccine counseling among medical students after lecture on HPV.

Survey statement	Mean score at pretest	Mean score at posttest	Mean change between pre- and post- tests (95% CI)
I am comfortable counseling eligible women 18–26 years old on HPV vaccination.	0.32	0.96	0.62 (0.48, 0.76)
I am comfortable counseling eligible men 18–26 years old on HPV vaccination.	0.25	0.95	0.70 (0.56, 0.74)
I am comfortable counseling parents of girls on the HPV vaccine for their child.	0.31	0.94	0.62 (0.48, 0.76)
I am comfortable counseling parents of boys on the HPV vaccine for their child.	0.28	0.95	0.73 (0.59, 0.86)
I am willing to discuss HPV vaccination when patients come in for other problems.	0.76	0.93	0.14 (0.04, 0.23)
I need the following to be more comfortable with counseling patients/parents:			
More education on HPV vaccination	0.83	−0.04	−0.86 (−1.00, −0.71)
More safety data on HPV vaccination	0.59	−0.21	−0.85 (−1.00, −0.71)
More time on the market	0.08	−0.41	−0.49 (−0.63, −0.36)
School requirement for HPV vaccination	0.12	−0.30	−0.45 (−0.60, −0.31)
Data on vaccine not promoting sexual activity	0.08	−0.37	−0.41 (−0.56, −0.25)
I am comfortable educating vaccine hesitant patients about HPV vaccination.	0.47	0.88	0.39 (0.26, 0.52)
I am comfortable offering the HPV vaccine to patients who are:			
9–10 years old	0.18	0.78	0.58 (0.45, 0.71)
11–12 years old	0.50	0.94	0.45 (0.34, 0.51)
13–17 years old	0.75	0.96	0.23 (0.15, 0.32)
I am uncomfortable recommending a vaccine against sexually transmitted infections.	−0.61	−0.66	−0.01 (−0.16, 0.13)

Bolded values indicate significance at $p < .05$. CI = confidence interval.

Table 4. Impact of lecture on comfort with HPV vaccine counseling (N = 256).

Characteristics	Comfort with HPV vaccine counseling (15 items)*			
	Pretest (mean score)	Posttest (mean score)	Mean difference (95% CI)	p-value†
Overall	6.0	7.5	1.43 (0.75, 2.11)	0.0002
Age				
<30	6.0	7.5	1.43 (0.74, 2.13)	0.0003
≥30	6.1	7.4	1.29 (−1.97, 4.54)	0.47
Gender				
Female	6.2	7.5	1.32 (0.31, 2.34)	0.004
Male	5.9	7.4	1.51 (0.59, 2.43)	0.02
Race/ethnicity				
White	6.0	6.8	0.79 (−0.19, 1.77)	0.15
Asian	6.0	8.9	2.85 (1.37, 4.33)	0.0002
Hispanic	5.1	7.2	2.09 (0.34, 3.85)	0.03
Black/African	7.0	6.9	−0.14 (−2.60, 2.32)	0.56
Other	7.9	8.0	0.06 (−2.28, 2.41)	0.93
HPV vaccine uptake				
Yes	6.0	6.9	0.87 (−0.13, 1.87)	0.09
No	6.2	8.0	1.78 (0.62, 2.95)	0.01

CI = confidence interval.

*Mean scores calculated as an average of the total sum score (range = −15 to 15) for each participant on questions related to comfort with HPV vaccine counseling. Higher scores indicate greater readiness to counsel.

†Wilcoxon signed rank test with two-sided test.

Discussion

Overall, this pretest/posttest study found that a brief educational intervention can improve medical students' attitudes toward the HPV vaccine and comfort with counseling families. The primary reason cited by families for vaccinating their child against HPV is that their provider recommended it and patients and parents who receive vaccine information from their providers are more knowledgeable and likely to be vaccinated.^{6,14–16} This finding led to a national initiative in the US to increase the frequency and strength of provider recommendation which, in turn, may have contributed to a decrease in the number of patients who did not get vaccinated due to lack of a recommendation.^{17,18} Including medical students in these educational programs could enhance

efforts to increase recommendations by providers as medical students assume patient care responsibilities upon graduation when they enter residency programs. Moreover, increasing students' comfort with counseling may be critical to improving the frequency and strength of their recommendations during the rest of their careers, especially among those who did not receive the HPV vaccine themselves.

A recent meta-analysis found that interventions focused on increasing provider attitudes may have a greater impact on HPV vaccination initiation than patient-focused interventions.¹⁷ However, providers have little time and previous interventions have been time- and resource-intensive.^{19,20} Increases in intention to recommend the HPV vaccine have been achieved with a previous intervention, but consisted of an intensive week-long exercise.²¹ Our intervention is more practical as it consisted only of a single lecture given to medical students by an expert, which most stated was their preferred source of information.

At baseline, medical students reported greater comfort in offering the HPV vaccine to older adolescents. This is consistent with prior reports that medical providers are more comfortable discussing the HPV vaccine with older adolescents, as they are concerned the discussion may lead to talking about sexually transmitted infections or other topics for which parents may feel their children are not yet ready.²² Education, however, may improve their comfort with recommending the HPV vaccine to patients in the recommended age group of 11–12 years old. We found that after our lecture, there were substantial increases in comfort with counseling about HPV vaccination for all age groups, including preteens and early adolescents. These results are encouraging since evidence shows HPV vaccination is more effective when given during early adolescence.²³ Moreover, completion of the series is more likely when the vaccine is initiated at a younger age.²⁴

Although the HPV vaccine has been on the market for more than a decade and is proven safe, there is a persistent

fear among patients and providers that it may cause serious side effects.^{25,26} This perception can be a barrier to physician recommendation.^{27–31} The pretest portion of our study showed that these fears are still present, even among medical students who began their training many years after the vaccine was approved. After the lecture, however, we observed nearly a quarter no longer agreed with the belief that the vaccine may cause serious side effects. Since provider recommendation is strongly associated with parental acceptance of HPV vaccination,⁶ it is important to dispel myths about HPV vaccination among providers so they are willing to provide strong recommendations for the HPV vaccine to families.

We also found significant improvements in the students' overall comfort with counseling patients when all of these questions were combined into one scale. The intervention had more of an effect on students who self-identified as Asian or Hispanic that may have been due, in part, to the fact that Hispanic students had lower pretest scores than other groups. Differences in comfort by vaccination status and demographic characteristics may reflect broader differences in existing HPV vaccination knowledge and beliefs among providers and medical students.^{10,32} In particular, an earlier study found that unvaccinated students more frequently felt that they preferred to wait until a child was older to recommend the HPV vaccine, and were not as willing to discuss HPV vaccination when children came in for other problems.³² This study demonstrated that a brief lecture could significantly improve unvaccinated medical students' comfort level for counseling their patients about the HPV vaccine.

This study has important limitations. Participants self-reported HPV vaccination status which is subject to recall bias and may be subject to social desirability bias. The data is also limited to a convenience sample of medical students at a single university in Texas and therefore may not be representative of healthcare students in other parts of the US. Additionally, our study is limited to a non-randomized pre-/posttest design and did not include a control group for comparison. Moreover, medical students' reports of confidence in counseling patients regarding HPV vaccination may not necessarily translate to their future practice. Future research, perhaps involving patient simulation or observation of actual patient encounters, is needed to determine long-term effects on counseling practices.

Overall, we found that many medical students have low baseline knowledge of HPV vaccination and do not feel comfortable counseling the parents of their younger patients about it. However, a brief educational intervention by an expert can improve their knowledge, attitudes, and comfort with counseling. This study supports including material on HPV vaccination in the standard medical student curriculum. Interventions similar to the one we implemented are important to ensure that future physicians are comfortable with recommending this cancer preventing vaccine to all eligible patients.

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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